Estimating Deer Abundance in Maryland's
Chronic Wasting Disease Management Area

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Introduction

Chronic Wasting Disease (CWD) is a fatal neurological disease found in deer species throughout North America. Because of the social and economical importance of deer hunting, the disease is a major concern for biologists and state wildlife managers. Transmission occurs laterally by direct or indirect contact with the bodily fluids of an infected individual. High deer densities may facilitate increased disease transmission rates. Knowledge of local population demographics, specifically density, is therefore vital to any management decision.

In November 2010, a yearling white-tailed buck was harvested within Green Ridge State Forest in eastern Allegany County that tested positive for CWD. The Maryland Department of Natural Resources' preexisting CWD response plan called for a detailed herd assessment in the area of the positive test. Two of the most widely used methods for estimating deer demographics are distance sampling and infrared triggered camera surveys. Our objectives where to obtain estimates for density, adult sex ratio, and fawn/doe rates using both survey methods. A comparison of multiple methods will provide insight to the strengths and weaknesses of each and result in final estimations that more closely resembles the true population.

Methods

Distance sampling for deer consisted of driving roads throughout Green Ridge State Forest after dark and at slow speeds (≤16 km/hr). A two person team (driver and observer) surveyed the right side of the road only. When a deer or cluster of deer were observed, we recorded number of deer, age class (fawn/adult), sex (adults only), and perpendicular distance from the road using a laser rangefinder. We performed distance sampling with both a spotlight and a Forward Looking Infrared (FLIR) unit on alternating nights. Deer density with line transect estimates were obtained using software DISTANCE.

For the camera survey, the study area was divided into 20 grids consisting of 100 ha each. A motion triggered infrared camera was placed near the center of each grid and baited with 11 kg of shelled corn. Camera sites were visited every 3rd day to replenish corn piles. We analyzed photographs according to the Jacobson Camera Survey method. A detection probability for adult males was determined using uniquely identifiable antler characteristics. We extrapolated that probability to determine the number of individual does and fawns within the survey area.

Results

The 45 km transect was run 12 times (6 spotlight, 6 FLIR). We observed 18 clusters totaling 57 deer and 25 clusters totaling 51 deer for spotlight sampling and FLIR sampling, respectively. The camera survey resulted in 14,214 images of deer (11,314 adult does, 2,411 antlered bucks, 1,297 shed bucks, 7,081 fawns, and 1,103 unknowns). We uniquely identified 25 antlered males. Using a detection probability of 0.0104, we estimated 117 individual females, 14 individual shed bucks, 73 individual fawns, and 11 unknowns. Density estimates for all 3 methods were lower in February than August (Table 1).

Table 1. Density and demographic estimates for white-tailed deer in Green Ridge State Forest obtained via 3 survey methods during August 2012 and February 2013.

August 2012

Method	Density (Deer/km^2[SE])	CV(%)	95% CI	Sex Ratio (Doe:Buck)	Fawns/Doe
FLIR Ground Survey	6.38 (1.11)	17.4	4.29 - 9.49	2.7 : 1	0.46
Spotlight Survey	6.00 (1.57)	26.1	3.53 - 10.21	2.0 : 1	0.38
Jacobson Camera Survey	12.42 (n/a)	n/a	n/a	2.5 : 1	0.28

February 2013

Method	Density (Deer/km^2[SE])	CV(%)	95% CI	Sex Ratio (Doe:Buck)	Fawns/Doe
FLIR Ground Survey	3.33 (0.94)	28.3	1.87 - 5.90	n/a	n/a
Spotlight Survey	3.16 (1.00)	31.7	1.66 - 6.00	n/a	n/a
Jacobson Camera Survey	12.03 (n/a)	n/a	n/a	3.1 : 1	0.63

Discussion

The 2 distance sampling methods again resulted in similar estimates, although point estimates were much lower relative to the August survey (6.38 and 6.00 deer/km^2 for FLIR and spotlight, respectively) and had greater coefficients of variation. We were unable to obtain demographic information from distance sampling due to an inability to confidently classify the sex and age of individuals. We believe February distance sampling estimates were biased low for 2 reasons: 1) roads were generally located at higher elevations and deer seemed to be concentrated at lower elevations, and 2) deer were likely avoiding areas near roads immediately following the hunting season.

The February camera survey provided a density estimate nearly identical to the August survey. We observed a reduction of 1.0 adult males and 1.4 adult females /km^2, which was similar to the observed harvest for the area. The reduction in adult deer was negated by an increase of 1.6 fawns and 0.4 unknowns /km^2. We attribute the discrepancy to weaning fawns having less interest in bait sites, resulting in a reduced fawn detection probability during the August survey. We observed 12 individual bucks that appeared in both the August and February surveys. Additionally, of the 58 unique bucks identified in August, none were captured at more than 1 camera site; however, 9 of 25 unique bucks in February were captured at 2 or more camera sites, suggesting a significant seasonal shift in home range size.

We continued to collect fecal samples for a mark-recapture analysis using DNA. We are currently extracting and analyzing 272 samples (145 August samples, 127 February samples). Fecal analysis is not sensitive to behavior among different sex or age classes that may bias other abundance estimators, and would therefore be incredibly valuable as a comparison to more traditional methods.